

## TOWARDS AN ASSESSMENT OF AFRICAN SCALES

by

HUGH TRACEY

It would appear from the evidence of certain writers on African musics that there still remains much confusion about the subject of African scales and modes. A tenacious misconception continually occurs, namely that African scales or modal systems are but an imperfect imitation of, or striving towards, the western system. Nothing, of course, could be further from the truth. It is with the intention of opening the subject for discussion by members of the Society and others interested in this aspect of musicology throughout the African world that this short article is now written.

In order to avoid a confusion of terms which would take too long to enumerate here it might be as well for the reader who is interested to refer to the references to Scales and Modes in the *Oxford Companion to Music*, by Percy Scholes or to *Grove's Dictionary of Music and Musicians*, and elsewhere. Scholes, for example, remarks of scales that "Apparently any combination of notes whatever may be adopted as the material from which a peasantry, or a composer, or a group of composers may make their tunes, and there exists not even one interval common to all the scales of the world".

Our problem, therefore, in studying the scales of African peoples is to discover what series of notes are acceptable and commonly used in different regions, within various tribes and circumstances, to note their similarities and dissimilarities and, from the empirical data obtained, to determine if there is a sufficient number of common factors between them which would justify our making certain generalisations on African scales and modes at this juncture.

Let it be clearly stated at the outset that the ear of any observer, however musical or blessed with so called "absolute pitch", unaided by an accurate set of tuning forks or well graduated electrical pitch indicator, is wholly inadequate for determining the relative pitch of African scales on account of the many psychological complications which intrude, a prejudice in favour of known familiar intervals being the most usual. A set of 12 forks commonly employed to tune a piano, with graduations in tempered semitones only, like the piano itself, is also quite inadequate for the purpose. The set we have used for many years at the headquarters of the African Music Society is graduated in steps of four vibrations from 212 vs. to 424 vs., giving fifty four forks to this one octave in the middle of the piano range. A more accurate set of forks with steps of only two vibrations, or cycles per second, is mentioned elsewhere in this Journal (P. 77). When using these forks the student is only required to determine unisons which minimises the possibility of inaccuracy.

Most electrical pitch indicators are not intended for such work and their calibration cannot be guaranteed.

The first problem facing the student of African scales is to find the instrument or voice of an accredited performer which can be said to be representative of the group being studied. Unfortunately, the voice is a notoriously inaccurate instrument and can wander from pitch almost with impunity or adapt itself to the dominant musical instrument of the moment if the performer is not strong enough to resist it. In many African tribes we have only the pitch of voices to rely upon. In this case, measurement should be taken during the singing of a single verse of each song tested. Subsequent verses may be sung at different pitches and slightly confuse the experiment.

The difficulty of comparing scales of varying range is largely overcome by the use

of the logarithmic conversion tables which enable one to measure the interval between any two notes whose pitches in vibrations per second are known.<sup>1</sup>

The difficulty of measuring accurately the pitch of voiced notes always remains unless it can be done from a recording. The Library has installed a simple repeater magnetic tape system which makes the task less complex. It has been shown by research workers such as Mr. Charles Seeger<sup>2</sup> that the pitch of the human voice on any one note is liable to modification by several other influences such as the pitch of vowel sounds, vibrato and slurs.

A second complication therefore intrudes itself into the measurement of voice pitch which is wholly psychological and may be described as *tolerance*. The degree of *tolerance* which is acceptable to any particular audience or community in wavering on and off pitch must be largely a matter of taste and established by general consent. In some cases true pitch may be required, and in others, such as in the case of the flexible tone of a coloratura soprano or the violin, a definite wandering on and off pitch is demanded for the sake of 'tone'.

We are, therefore, reduced to measuring instruments of fixed pitch for the most reliable data concerning the ideal scales of a tribe. Provided they have been carefully tuned beforehand and can hold their tuning for a considerable time, this class of instruments in Africa is likely to provide us with the most accurate information, revealing the true intention of the musician and the general acceptance of his audience. With tribes such as the Zulu, Sotho and Xhosa which have no such instruments at all, the testing of voices will have to suffice.

Xylophones, and the various members of the *Mbira* or *Likembe* family of instruments, are ideally suited for this purpose. Wind instruments are not so good as they are subject to variation with the strength of wind velocity and the position of the lips or mouth of the player over the orifice or embouchure. The notes of the harmonic series, as found in a trumpet or bugle are not subject to human variation and are fixed physically by the nature of the instrument, being mathematically exact and not adopted by free choice. They are universally the same and are not considered here.

It is largely from xylophones and *Mbira* that our most accurate information of African scales has so far been collected. There is little reason to suppose that the scales presented upon these instruments are in any way exclusive to those instruments alone, though it will have been noted by students in the field that the scale of a single instrument is not necessarily the only scale or mode employed by a single community. On several occasions I have noted that the scale of the xylophone has not followed the scale of the sets of pipes used in the same village, and upon the suggestion that the two types of instruments might be played in ensemble, the local musicians immediately declined stating that they could not play them together as they were tuned to two different scales. In certain regions of the lower Zambesi Valley, two or three types of *Mbira* (hand piano) are found in the same village, each with its own modality so that they, also, cannot be played in ensemble.

It is clear, therefore, that a few African communities may not recognise and employ a single scale or mode only, but may on occasion use more than one scale, and from them evolve more than one mode of performance. A naturally pentatonic people may sing not only in pentatonic modes but in several such modes. Their theoretical chromatic scale (if such existed) would not then contain only five intervals, but the summation of all their note pitches from a given tonic. This would provide an apparent scale far more

<sup>1</sup> Any member of the African Music Society who would like to have a logarithmic conversion table (from vibrations per second to cents) may obtain one free of charge from the Honorary Secretary, African Music Society.

<sup>2</sup> "African Music" Vol. 1. No. 4. P. 55.

differentiated than the tribal performers would be able to employ at any one time. (It is indeed notable that most Europeans have great difficulty in singing unaided a true chromatic scale but little difficulty in singing the diatonic major or minor scales). On the other hand, it opens up the possibility of providing a keyboard instrument of considerable versatility, tuned to the 'just' intonations of the local tribe or community.

A further complication arises in the question of the direction in which it is normal to think of a scale or mode, from high to low or from low to high. The average European thinks upwards. The average African, in our experience, prefers to sing a scale from high to low. It will be remembered that so far as we have discovered, there are no words in any African language to express 'high' and 'low' pitches of sound. Theirs is not an 'altitude' concept of pitch but rather a 'magnitude' one, a low note being to them a '*large note*' and a high one a '*small note*'.

Most African musicians I have tested, among those who have not been influenced by mission or white teaching, have had considerable difficulty in singing up a scale but none whatsoever in singing down. It is notable that few authentic African compositions, un-influenced by foreign teaching, contain more than three or, at the most, four consecutive rising notes in any melody. The presence of such a run in any melody they are heard to sing, indicates almost invariably that the composition is of foreign origin. The songs of the Bemba and Tabwa of Northern Rhodesia and Southern Congo and possibly of the Fipa also, are exceptions to this general rule.

Here then are fundamental differences between European and African outlooks upon music which must be borne in mind when investigating African scales and modes.

It will no doubt be agreed that if a number of scales or modes are found to be employed in any single community, some of which are more complex than others, that the community can be credited with a musical sensitivity corresponding to the more differentiated scale. Thus a tribe which sings one song in a pentatonic mode and another in a heptatonic one should be credited with the greater pitch sensitivity of the latter.

From work already achieved with accurate measurements taken on the spot against our sets of tuning forks, certain preliminary generalisations are now possible. We are now fully justified in classifying certain tribes or language groups as being pentatonic, hexatonic or heptatonic. One small group of tribes only, in our experience, appeared to be tetratonic from the available evidence but there was insufficient data to confirm this conclusion.

During the course of my various Recording Tours throughout Central and Southern Africa, I have measured the scales of many instruments and the lists of 80 tribes given below are classified from my personal knowledge of them, mostly in their home districts, and are not complete as they omit all those tribes among whom I found no instruments of fixed pitch.

The following tribes have been found to employ only pentatonic scales. Many of these tribes, however, have more than one such pentatonic scale but no apparent chromatic ability:—

*Pentatonic Tribes:*

Alur.	Luo.	Nyoro/Ruli.
Balendu.	Luya/Hanga.	Nyoro/Toro.
Chopi (Nilotic).	Mbuti (Pygmies).	Rambo (Ulele).
Dhola.	Nande.	Rundi.
Ganda.	Nandi.	Rwanda.
Gogo.	Ndebele.	Soga.
Kipsigis.	Ndongo.	Tumbuka/Henga.
Lenje.	Ngbandi.	Wanga.
Lozi (Caprivi).	Nkonde/Nyakyusa.	Yogo.
Luba.	Nyanja/Chewa.	Zande/Bandiya.
Luba/Lulua.	Nyoro.	Zaramo.

NOTE: The Nilotic Chopi of Uganda are not related to the Chopi of Moçambique.

The Lozi of the Caprivi strip may have belonged to another clan as the main body of Lozi are Heptatonic.

The Luba is a large cluster of tribes some of whose members are also hexa- and heptatonic. Mbuti Pigmyes play the instruments of the Nande tribe which lives outside that portion of the Ituri Forest which they inhabit.

Ngbandi is also heptatonic.

Nyanja/Chewa have several scales, also hexa- and heptatonic.

Rundi is also hexatonic.

Tumbuka/Henga is mostly heptatonic.

The following tribes have constantly demonstrated Hexatonic scales in their instruments:—

*Hexatonic Tribes:*

Benge.	Luba/Lulua.	Nyanja/Manganja.
Bukusu.	Luchazi.	Rundi.
Hehe.	Luvale/Lwena.	Tonga/Hlanganu.
Kanyoka.	Luya.	Tonga (Nyasaland).
Luba.	Ndau.	Tswa/Hlengwe.

NOTE: Luba, see note on Pentatonic tribes.

Rundi, also pentatonic.

The Tonga/Hlanganu and the Tswa/Hlengwe admit having learnt their instrumental playing from the Ndau.

The remaining Tribes whose instruments have been measured employed Heptatonic scales:—

*Heptatonic Tribes:—*

Bemba.	Mbunda.	Shona/Manyika.
Binza.	Medje.	Shona/Zezuru.
Bira.	Ngbandi.	Swahili/Nguja.
Buudu.	Nyanja/Chewa.	Tabwa.
Chopi.	Nyamwezi.	Tonga (Plateau).
Gishu.	Nyoro/Haya.	Tonga (Zambesi Valley).
Lala.	Sena.	Tswa.
Lozi.	Sena/Nyungwe.	Tumbuka/Henga.
Luba/Lulua.	Sena/Tonga.	Venda.
Luba/Songe.	Shona/Karanga.	Zinza.
Lunda.	Shona/Korekore.	

NOTE: This list of Heptatonic tribes undoubtedly contains the names of many of the most musical tribes whose music we have recorded.

The Ngbandi are also Pentatonic.

The Nyanja/Chewa of Central Nyasaland are also hexa- and pentatonic.

Normally, one would suppose that 'Heptatonic' people were more musically inclined than the others; but this is not always so. Some of the most musically active tribes among whom we have recorded have been Pentatonic, and, as musicians will appreciate, many Pentatonic melodies are strong and vital.

The tone centre of the scales employed varied very much from tribe to tribe, but never far from the middle voice register. Highly musical tribes such as the Chopi of Moçambique had decided views upon the correct pitch of their tone centre, instruments used by members of different clans within the tribe being readily recognised by the pitch of their tone centre, the scales themselves being very similar in steps regardless of the pitch around which they were centred. The tone centre of many African scales is not easy to determine, often for lack of an adequate vocabulary of musical terms in the local language.

I have noted over the years, that the tuning of the tribal scales is often more regular and constant where the history of the tribe in question had been undisturbed or isolated. The tunings of a tribe recently overrun by another frequently show great irregularities and inconsistencies, which may well indicate some relationship with inherent characteris-

tics. This would naturally require considerable research before it became any more than an hypothesis and a subject for further investigation.

The musical scales used by a community are not merely the result of objective imitation of pitches and intervals experienced within a limited environment but are equally subjective, being the innate reaction of the community to the sound and quality of musical notes and the general acceptance of certain intervals and pitches as opposed to others, the one appearing to be 'in tune' or locally correct and the other 'out of tune', or alien. The dogmatic assertion that any one scale, taken out of its ethnological context, is more 'in tune' than another is, of course, untenable and has given rise to much confusion in educational circles in Africa. Only the insensitivity of foreign teachers and musicians could have allowed them to jump to such a conclusion and to foist upon a scientifically unaware race the folly of a musical notation which assumed that the alien tempered semitones of the piano keyboard were the ultimate in human tonality. A brief survey of the graphs which present themselves as the result of measuring African scales demonstrates the falseness of such a criterion.

A qualitative survey of the usual intervals found in African instrumental scales is interesting and may well indicate the trend of any one community, but should not be taken out of its context. A survey of this kind is worthless if it is couched in terms of European keyboard intervals, semitones, tones, thirds, fourths, etc., the only generalisations having so far proved valid being that the interval of a true octave (2:1) is observed by most, if not all, tribes; that some employ true fifths (3:2) or true fourths (4:3) but not very many; and that, in rare cases, intervals are found as small as or smaller than a tempered semitone.

The distinctive tonality of negro or African voices apart from any national formants which arise from language tone or other physiological means, appears largely to be due to the instinctive selection of their normal modes. This is best appreciated in unaccompanied singing, and throughout Africa is clearly discerned by a musically sensitive foreigner when the African group sings exotic songs which are more familiar to the observer in their original setting. The lack of an African interval as small as a semitone is particularly noticeable in their singing of hymns.

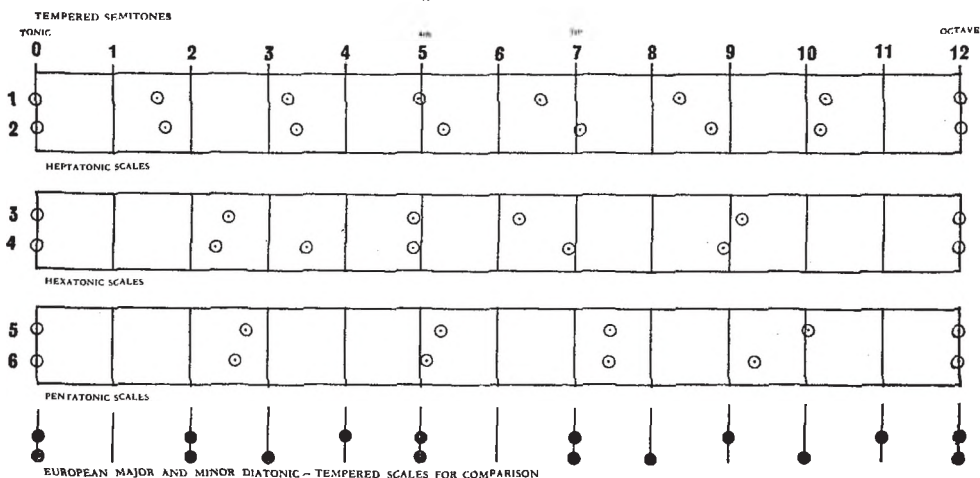
If a sufficient number of musicologists or physicists can be found to investigate this phenomenon with accurate sets of tuning forks it should not be many years before we could arrive at some valid conclusions which would remove the present confusion and give the literate African composer a better foundation upon which to work in future without false reference to any alleged 'international' keyboard tuning.

## TYPICAL AFRICAN SCALES

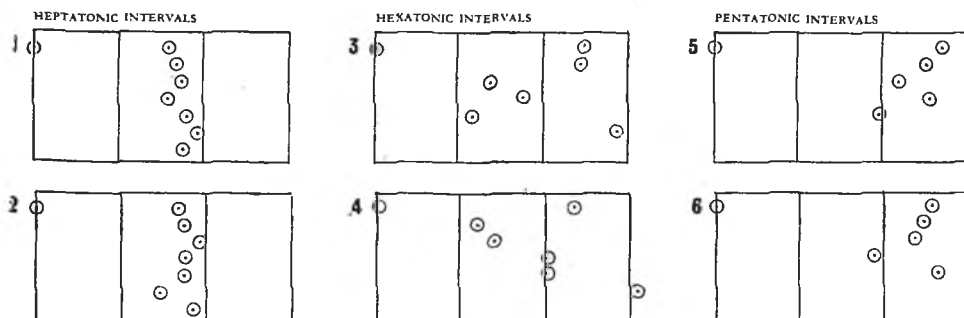
HEPTATONIC SCALES			HEXATONIC SCALES			PENTATONIC SCALES		
1. <i>Chopi</i> . (43-125) Mozambique			2. <i>Bemba</i> . (L2W-9) N. Rhodesia			3. <i>Ndau</i> . (CMR-46) S. Rhodesia		
Vs.	Cents.		Vs.	Cents.		Vs.	Cents.	
504	173	1200	280	182	1200			
456	193	1027	252	143	1018	736	285	1200
408	179	834	232	173	875	624	115	915
368	157	655	210	173	702	584	175	800
336	173	498	190	192	529	528	136	625
304	168	325	170	172	337	488	243	489
276	157	157	154	165	165	424	246	246
252		0	140	165	0	368	246	0
4. <i>Kanyoka</i> . (L3D-1) S. Congo			5. <i>Soga</i> . (F3P-6) Uganda			6. <i>Yogo</i> . (F4H-15) N. Congo		
Vs.	Cents.		Vs.	Cents.		Vs.	Cents.	
392	309	1200						
328	201	891	520	197	1200	448	267	1200
292	201	690	464	257	1003	384	190	933
260	139	489	400	221	746	344	237	743
240	119	350	352	254	525	300	248	506
224	231	231	304	271	271	260	258	258
196	231	0	260	271	0	224	258	0



### Examples of African Scales—Heptatonic, Hexatonic and Pentatonic in relation to Tempered Semitones



### Intervals used in the same Scales



**NOTE:** The following instruments were measured for the above scales which have been taken from my note books at random . . . No. 1. *Timbila* xylophone. No. 2. *Mumamba* mbira. No. 3. *Mbira dza WaNdau*. No. 4. *Silimba* xylophone. No. 5. *Budongo* mbira. No. 6. *Kombi* Likembe (mbira).

The use of a graph to 'visualise' the various African scales makes it possible to appreciate the basic intervals used. For example with the Chopi scale (No. 1) the following observations are possible . . . The typical Chopi harmonies of fourths and fifths are possible when playing A to D (498 cents); B to E (498 cents); C to F (509 cents) and G to C' (498 cents); the two fifths are C to G (702 cents) and D to A' (702 cents). In addition minor thirds, (+) with an average of 333 cents are possible from A to C (325 cents); B to D (341 cents) C to E (330 cents); and D to F (336 cents); with two 'major thirds' (—) of an average 369 cents from E to G (372 cents) and F to A' (366 cents). All the octaves are true in a Chopi scale. Thus the Chopi heptatonic scale is a most practical one and capable of the widest range of harmonious sound.